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Wednesday, March 6, 1991
4:00PM–5:00PM, Room 215, East Concourse
Aging and Altered Cardiovascular Responses

4:00

INFLUENCES OF SYMPATHETIC DENERVATION AND SYSTOLIC UNLOADING ON CARDIAC MANIFESTATIONS OF AGING

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Normal aging is associated with increased cardiac mass, thought to be due to increased afterload and vascular stiffness, prolonged ventricular relaxation and impaired early diastolic filling. To investigate the influence of denervation and unloading on age related changes in LV mass and diastolic function we studied 14 quadriplegic men with spinal cord injury (SCI, 29-66 yrs) and 14 age-matched normal men (N, 30-74 yrs). Two-dimensional echoes and Doppler recordings were digitized for LV mass, volume (single plane Simpson's rule), mean wall thickness (h), RV and LV inflow velocity.

LV mass index (LVMI, 78+-10 vs 95+-7 g/m2, p=.001) and LV end-systolic circumferential wall stress (143+-44 vs 177+-34 kd/cm2, p=.03) were significantly lower in SCI than in N. Analysis of variance revealed differences in echo/Doppler variables between young (<50 yrs) and old (>=50) as shown below: (*p<.05 vs old, in SCI and N)

	Age	LVMI	BP	Stress	h	LV E/A	LV AFF	RV E/A
SCI young	37	82*	102/64	149	1.1*	1.4	.31	1.3
SCI old	60	73	103/59	136	.9	1.2	.37	1.0
N young	36	93	130/78	196	1.1	1.5*	.29*	1.5*
N old	60	96	125/74	157	1.1	.9	.39	1.1

(E/A is early/atrial flow velocity ratio, AFF is atrial filling fraction, 7 subjects in each group)

Unlike N, in SCI both LVMI and h decreased with advancing age (r=.45, p=.07 and r=.57, p=.03). Reduced LVMI was independently correlated with: decreased activity and decreased blood pressure as well as age (r=.85, p=.003 overall for stepwise regression model). In N, Doppler measures of LV filling were correlated with advanced age: reduced LV E/A (r=.69, p=.006), reduced RV E/A (r=.63, p=.01), and increased AFF (r=.62, p=.01). In contrast, no correlation was found between any parameter of LV filling and age in SCI.

In conclusion, LV mass index and h decrease with advancing age in SCI, contributing to the lack of age-related changes in the LV filling pattern. Sustained sympathetic and hemodynamic loads are more important than advancing years in producing the changes in cardiac size and function that are seen in the normal elderly.

4:15

EFFECT OF NORMAL AGING ON ATRIAL NATRIURETIC FACTOR AND ATRIAL PRESSURES DURING POSTURAL AND EXERCISE STRESS

Dalane W. Kitzman, M.D., Polly A. Beere, M.D., and Michael B. Higginbotham, M.B., Duke Univ. Medical Center, Durham, NC

We have previously shown that atrial natriuretic factor concentration (ANF) increases progressively during graded upright bicycle exercise, and is associated with increases in both left and right atrial pressure. To determine the effect of normal aging on ANF and atrial pressures during postural as well as during exercise stress, we studied 32 young (Y, age 20-40) and 22 old (O, age 60-80) healthy normotensive male volunteers with normal screening echocardiograms and exercise radionuclide angiograms. Swan-Ganz and brachial artery catheters were inserted for measurement of right and left atrial pressure (RAP, PWP; mmHg), mean arterial pressure (MAP; mmHg) and arterial ANF (pg/ml) following 30 minutes of supine rest (SR), 5 minutes after assuming upright seated rest (UR), and during maximal upright bicycle exercise (MAX).
(O vs Y: *p<0.05 † p<0.10)

	SR		UR		MAX	
	O	Y	O	Y	O	Y
ANF	38±22	35±20	36±20*	27±12	46±34	41±29
PWP	9.4±3.8	10.4±2.0	2.9±3.1*	0.5±2.0	8.7±4.6	7.2±3.1
RAP	6.9±3.6	7.4±1.9	-0.8±3.0†	-1.9±1.9	2.2±2.6	2.1±2.5
MAP	107±14*	94±7	111±16*	97±12	141±17*	130±11
HR	63±9	62±9	77±15	80±15	147±15*	181±13

Thus, ANF and atrial pressures decrease during postural stress and increase during upright exercise in young normal men. With aging, the increase in ANF and atrial pressures during exercise is unaltered; however, the decrease during postural stress is attenuated.

4:30

Comparison of Responses to Head Up Tilt Table Testing of Elderly and Young Patients with Syncope of Unknown Origin

Hugh Calkins, Joao Sousa, Rafel El-Atassi, Steve Schmaltz, Alan Kadish, Fred Morady, University of Michigan, Ann Arbor, Michigan, USA

Previous studies have reported that vasodepressor syncope is uncommon in elderly patients. We compared the response to head up tilt of a group of 52 elderly patients(age>60) and 59 young patients (age<60). The number of syncopal episodes prior to head up tilt was similar in both groups. Head up tilt (70 degrees, 15 minutes) was performed in the baseline state and on incremental doses of isoproterenol to a maximum of 8mcg/minute.

Results: Sixty one percent of elderly patients and 71% of young patients demonstrated a positive response(p=.3) The rhythm induced in conjunction with a positive response and the proportion of patients requiring isoproterenol to trigger a positive response was similar in both groups(p=.6). A predominantly vasodepressor response was more common in elderly patients than young patients(p=.002).

In conclusion, symptomatic elderly and young patients respond similarly to tilt table testing with the majority of both patient groups demonstrating a positive response. A predominantly vasodepressor response is seen more commonly in the elderly. These findings suggests that vasodepressor syncope may be an important and previously unrecognized cause of syncope in elderly patients.

4:45

CARDIAC BETA RECEPTORS AND BAROREFLEX RESPONSES WITH AGING

Michel White, Donna Holliwell, Frans H. Leenen, University of Ottawa Heart institute, Ottawa, Canada

Aging decreases the cardiac responsiveness to the non specific synthetic Beta (B) agonist, isoproterenol. In the present study we 1) Assessed the effect of age on chronotropic and inotropic response to a natural B2>B1 agonist epinephrine (epi); 2) Assessed the potential contribution of vagal tone on these responses by the administration of an $alpha_1$ agonist phenylephrine (phen) before and after atropine (AT). 8 young[Y], age=28±1 yrs and 8 old[O], age=59±3 yrs healthy volunteers were studied. LV responses were assessed by echo. Differences at the highest infusion rate are presented (mean±sem; *=p<.05 for the 2 dose-response curves)

	PHEN Pre-AT		EPI (all increases)				
	*SBP	HR	*SBP	*SV	*CI	*EF	HR
Y	+23±3	-20±3	20±2	25±3	1.9±.1	12±1	14±1
O	+47±9	-19±5	16±2	19±6	1.6±.2	9±2	16±3

Post AT Y and O responded similarly to Phen

Conclusions:
1) Phen results in increased SBP in [O]; this response is abolished by AT suggesting a decreased vagal baroreflex responsiveness with aging. 2) Aging decreases the inotropic but not the chronotropic response to epi; this response suggests: a) less attenuation of the decreased B mediated chronotropic response by decreased vagal baroreflex activity b) preferential down regulation of the myocardial B receptors mediated inotropic(B1)>B receptors mediated chronotropic(B2) response with aging.